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(54) Device for fusion splicing the ends of optical fibres

(57) The ends (9) of the optical fibres (5) are connected (fused) to one another in the device with the aid of an electric arc produced between electrodes (4). The required energy is taken from a source of AC voltage (1) which has a frequency of at least 1 kHz.

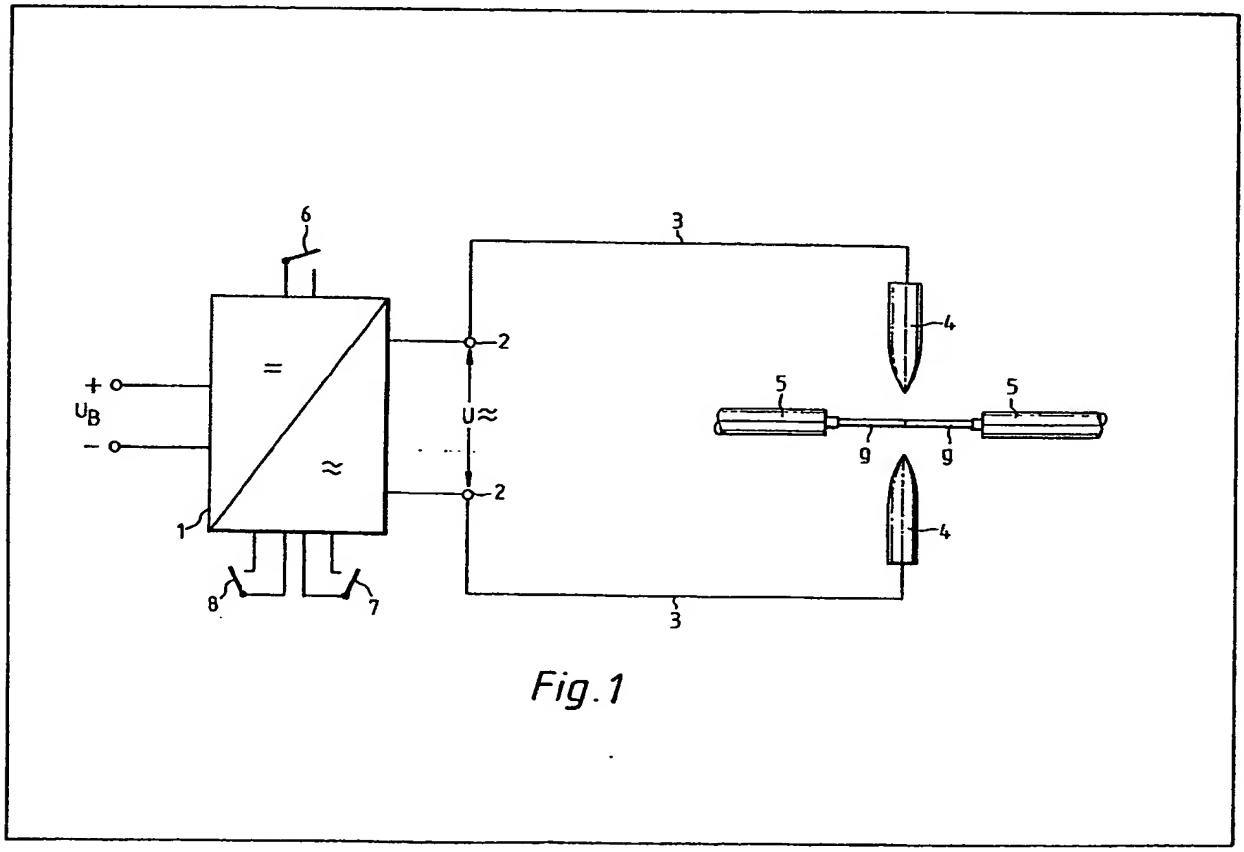

Fig. 1

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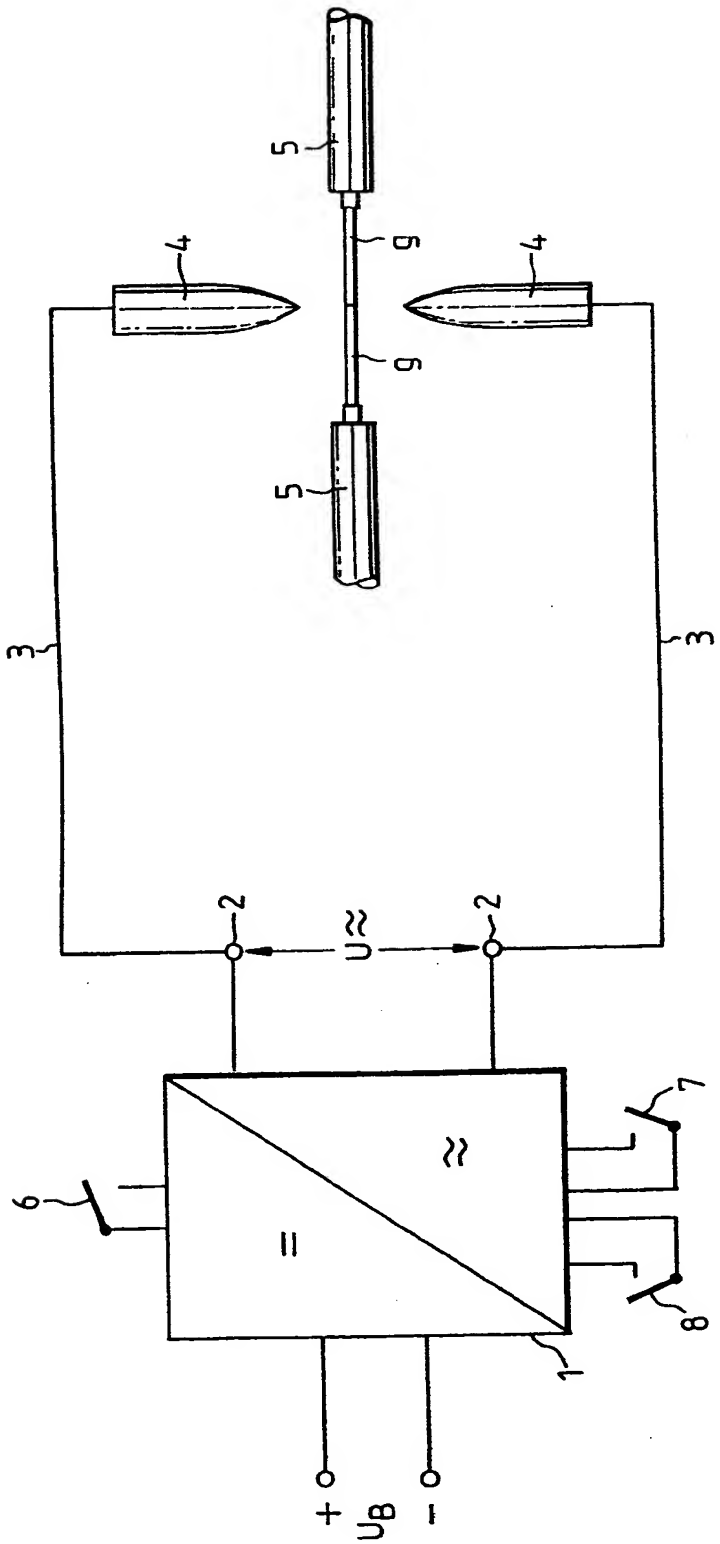

Fig.1

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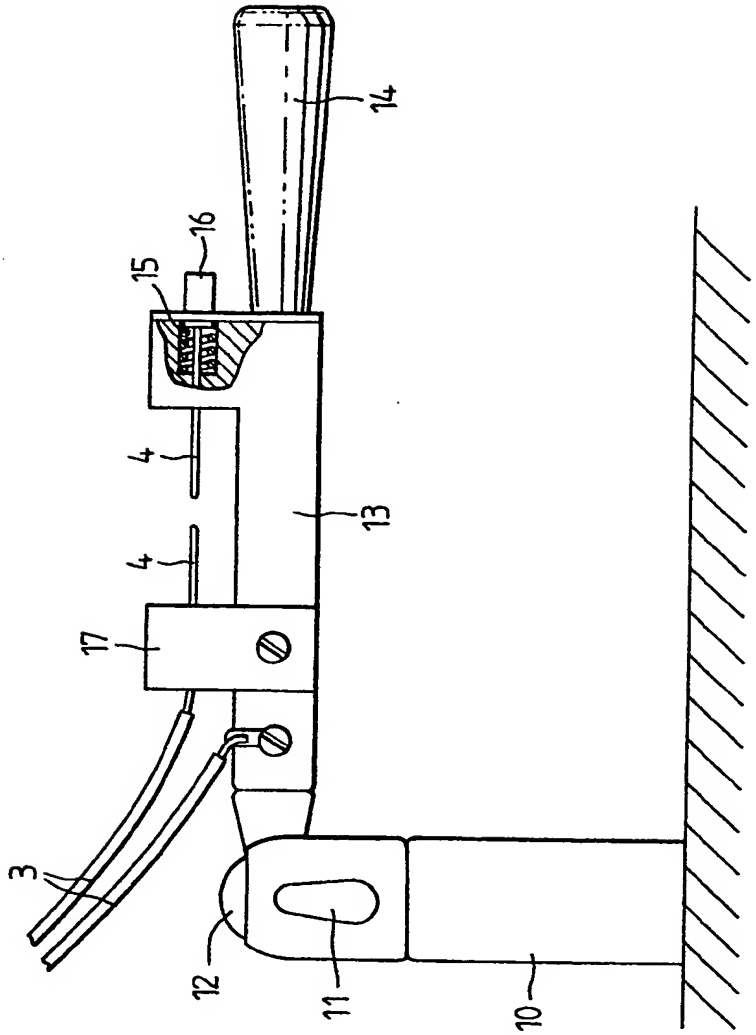

Fig.2

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SPECIFICATION

Device for fusion splicing the ends of optical fibres

The invention relates to a device for fusion splicing the ends of glass optical fibres (such as optical fibres made of fused silica) by means of an electric arc produced between electrodes, with the electrodes being connected to a source of AC voltage.

One such device is known from DE-OS 26 33 572. The AC voltage used in this device has a frequency of 50 Hz. Considering that the ignition voltage is at several thousand volts and the operating current ranges between 10 and 25 mA, dangerous conditions may occur when when touching live parts. Therefore, considerable safety measures are required in order to guard against the possibility of electric shock.

It is the object of the invention to provide a device for connecting the ends of optical fibres permitting a safe operation.

According to the present invention, there is provided a device for fusion splicing the ends of optical fibres in which device optical fibres are fusion spliced by means of an alternating current electric arc struck between opposed electrodes which arc has a frequency of at least 1 KHz.

The invention also provides method of fusion splicing optical fibres wherein heat required to fuse together the opposed ends of a pair of optical fibres is supplied by an alternating current arc having a frequency of at least 1 KHz.

Preferably the frequency is about 20 KHz, and advantageously an inverter is used for producing the alternating current, this inverter being fed from a battery, preferably an accumulator (storage battery), so that the device becomes independent of mains voltage terminals and can thus be freely moved.

The power constraints of the device may be such that it provides no shock hazard to persons accidentally touching any live (high voltage conducting) parts of the device. In addition the electric arc is found to exhibit a greater stability than in the conventional mode of operation.

There follows a description of an optical fibre fusion splicing device and method embodying this invention in a preferred form. The description refers to the accompanying drawings, in which:

Fig. 1 is a simplified representation of part of the device, and shows a source of AC voltage with electrodes connected thereto, and

Fig. 2 shows an electrode holding arrangement.

A DC to AC inverter 1 as shown in Fig. 1 has input terminals + and −, to which a source of low DC voltage U_B is applied. This DC voltage may be taken from a battery or storage battery (accumulator), preferably from a conventional 12 V battery. The inverter is of the conventional type and provides at its output terminals 2 a higher-frequency and short-circuit-proof AC voltage U≈ of about 20kHz. By actuating a turn-on contact 8, the source of AC voltage is switched to the ready-to-operate state. To the output terminals 2, via the lines 3, there are connected two electrodes 4 between which an electric arc is to be produced. The AC voltage U≈ has the necessary value ranging between 7 and 10 kV for serving as the ignition voltage, which reverts to a conducting voltage of about 1000 V once the arc is struck. In operation, the current drain from the 12 volts supply typically lies in the range of between 10 and 23 mA.

The inverter 1 is provided with a change-of-polarity protection device of the type known per se, for protecting it from being destroyed in the event of an incorrect polarity connection of the DC voltage U_B. There may also be provided a safety contact 6 which is actuated by a hood (not shown) covering the electrodes 4 which permits the source of AC voltage to be switched on only when the electrodes 4 are covered up. Preferably, the power provided by the inverter 1 is capable of being switched in at least two stages, with this being triggered by the actuation of a contact 7 designed, for example, as a non-locking pushbutton.

The electrodes 4 are made from a high-melting material, preferably from thoriated tungsten, with the free ends thereof being pointed.

Between the ends of the electrodes 4 in Fig. 1 there are shown parts of two plastics coated optical fibres 5, with the plastics-stripped glass fibre ends 9 thereof meeting against one another ready for being fused to each other. This fusion (welding) of the optical fibre ends is carried out in the conventional way in the electric arc. For the sake of simplicity, the holding arrangements and guides for the optical fibres 5, the optical fibre ends 9 and the electrodes 4 are not shown in Fig. 1.

Fig. 2 shows an electrode holding arrangement. A holder 13 for the elctrodes 4 is mounted to a perpendicular stand 10 via a ball joint 12 capable of being locked in position by a knob 11. The holder 13 is provided with an insulated handle bar 14. One electrode 4 is arranged movably in the free end of the holder 13. With the aid of a compression spring 15 and a non-locking pushbutton 16, this electrode can be moved in direction towards the other electrode.

The resulting reduction in the distance separating the electrodes 4 makes it easier to initiate the necessary arc ignition. Since the holder 13 is electrically conductive, the zero-potential side of the AC voltage U≈ connected to the holder 13 and, consequently, to the movable electrode 4. The stationary electrode 4 is accommodated in an insulating holder 17 and connected to the AC voltage output of the inverter 1 via the electric wire lead 3.

CLAIMS

1. A device for fusion splicing the ends of optical fibres in which device optical fibres are fusion spliced by means of an alternating current electric arc struck between opposed electrodes which arc has a frequency of at least 1 KHz.

2. A device as claimed in claim 1 wherein the frequency of the arc is approximately 20 kHz.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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3. A device as claimed in claim 1 or 2 which has a direct current input connected with the electrodes via an inverter.

4. A device as claimed in claim 3 wherein the inverter is a voltage step-up inverter.

5. A device as claimed in claim 4 wherein the power source for the inverter is a battery.

6. A device as claimed in claim 5 wherein the power source for the inverter is a 12 volt accumulator.

7. A device as claimed in claim 3, 4, 5 or 6, wherein the inverter is provided with switching means for switching its output to the electrodes in at least two stages.

8. A device as claimed in any preceding claim wherein means are provided for alteration of the separation of the electrode during operation of the device.

9. A device as claimed in claim 8, wherein one electrode is movable towards the other by a non-locating pushbutton against the action of a return spring.

10. An optical fibre fusion splicing device substantially as hereinbefore described with reference to the accompanying drawings.

11. A method of fusion splicing optical fibres wherein heat required to fuse together the opposed ends of a pair of optical fibres is supplied by an alternating current arc having a frequency of at least 1 KHz.

12. A method as claimed in claim 11, wherein the frequency of this arc is approximately 20 kHz.

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